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(71) Applicant
Ardfield Limited

(Incorporated in Ireland)

Alrport Road, Cloghran, County Dublin, Ireland

(72) Inventors
Brian Meyrick
Breda Meyrick

(74) Agent and/or Address for Service
Marks & Clerk
57-60 Lincoln's Inn Fields, London, WC2A 3LS,
United Kingdom

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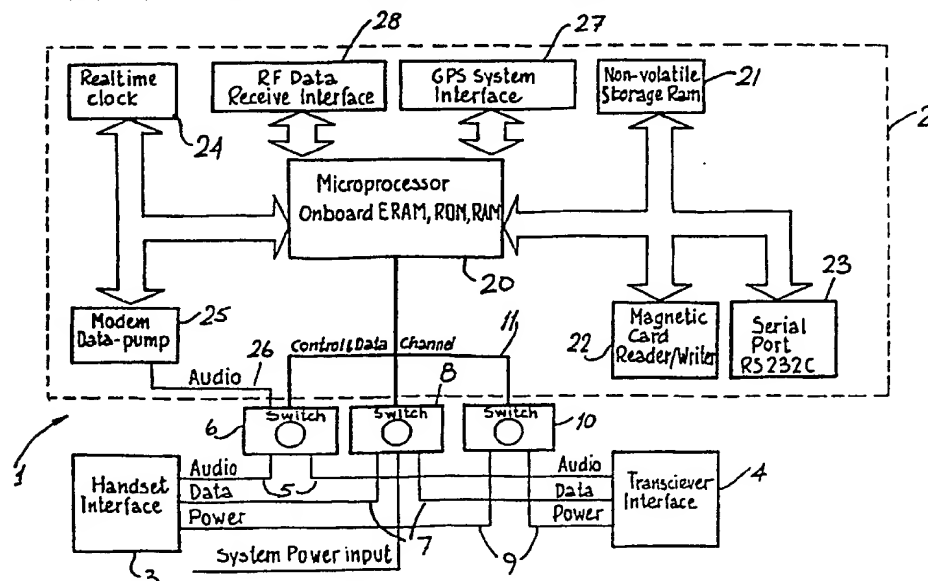
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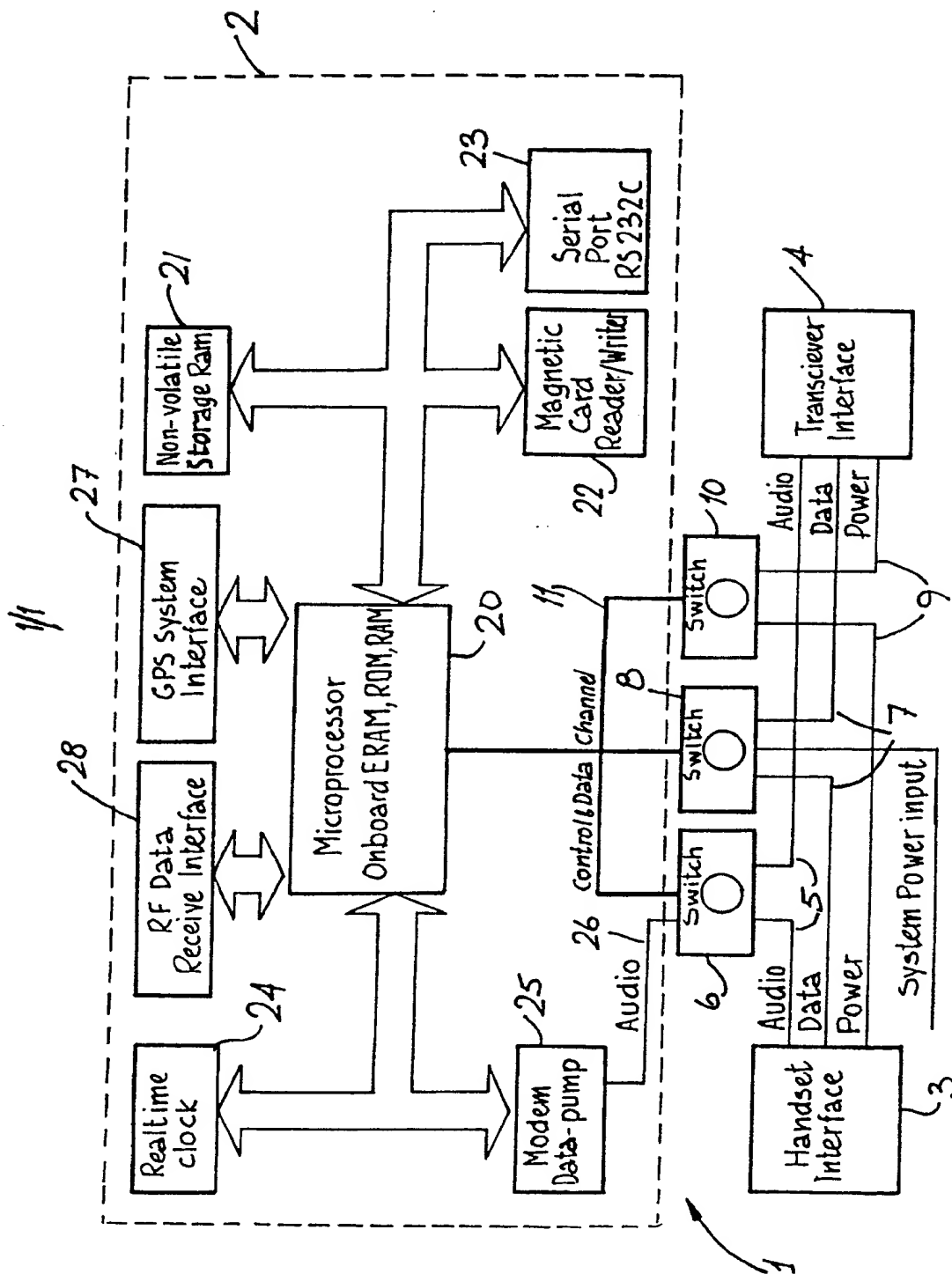
(54) A telephone controller

(57) A telephone controller has a handset interface (3) and a transceiver interface (4) so that it may be connected in a retro-fit manner to an existing mobile telephone. Another embodiment has equivalent interfaces for connection to domestic telephones, the important point being that the controller may be connected to an existing telephone. An RD data receiver (28) allows activation for uploading and downloading of data and control programs in a versatile manner. This leads to excellent control from a central control station. A control unit (2) has a microprocessor (20) which is programmed in permanent memory (21) to log received code data associated with a transceiver to which the interface (4) is to be connected. On power-up the control unit (2) automatically reads the code data of the actual transceiver and verifies it in comparison with that which was logged. Interfaces (3, 4) are coupled by switches (6, 8, 10) controlled by the microprocessor (20). A global positioning interface (27) may be included.



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"A telephone Controller"

The invention relates to control of conventional domestic telephones or cellular telephones.

- There are many situations where it is important to control usage of telephones. One example is a company which has a number of sales representative, each of which has a cellular telephone in his or her vehicle. In such a situation, it is often desirable to control the telephone calls which are made from such cellular telephones to reduce company cost overheads. Another example is a guesthouse, where there would be insufficient demand to warrant installation of a conventional payphone, but where from time to time customers need to make calls using a domestic telephone.
- 15 Japanese Patent Specification No. JP63102447 describes a telephone which incorporates a magnetic card reader and which has circuits which dial a number only when an identification code is recognised. European Patent Specification No. 134693 (Rathdown Industries Limited) describes a payphone and a coin acceptance mechanism and circuits for determining available credit for a subscriber. PCT Patent Specification No. WO 90/03077 (S.B. Meads) describes a mobile pay telephone system having electronics which control use of the telephone by reference to a coin acceptor mechanism.

The invention is directed towards providing improved control of either cellular or domestic telephones in a versatile manner so that existing telephones may be controlled without changing their circuits. In particular, a related object is to allow for greater versatility in utilisation of telephones. Another object

of the invention is that improved security be provided for preventing unauthorised access to telephones.

According to the invention, there is provided a telephone controller comprising:

- 5 a subscriber interface;
- a bus interface for connection to a telephone, and a bus interface for connection to a network bus;
- audio, data and power switchers connected between the bus interfaces;
- 10 a modulation/demodulation communication circuit for communication with a central control station via the network bus interface;
- a control unit comprising: -
- a non-volatile memory;
- 15 a real time clock;
- a control channel connected to the switches between the bus interfaces;
- a processor connected to the control channel and comprising: -
- 20 means for storing allowed subscriber call parameters;
- means for controlling subscriber call connections with reference to the allowed call parameters;
- means for monitoring actual call parameters and
- 25 for subsequently controlling the switches according to the monitored parameters values;
- means for re-setting the allowed subscriber call parameters; and
- means for allowing interrogation of stored
- 30 parameter values by the central control station, and for communication of data and programs with to the central control station;

a radio frequency data receiver connected to the processor; and

means in the processor for routing data received at the radio frequency data receiver to the subscriber interface
5 and for automatically monitoring said data and initiating a communications session in response thereto.

In one embodiment, the processor of the control unit is programmable and includes non-volatile memory for storage of data and control programs, and the communication
10 circuit has means for routing of revised control programs and data to the memory.

Preferably, the control unit comprises a security means comprising: -

means for logging received code data associated
15 with an allowed network bus before connection of the bus interfaces;

means for automatically reading actual code data for a network bus to which the bus interface is connected;

means for verifying the actual code data and
20 allowing or preventing operation of the telephone depending on the verification;

means for randomly generating a lock code for a network bus on positive verification;

means for automatically downloading the lock code
25 to the network bus; and

means for permanently storing the randomly generated lock code in the control unit for future reference.

The invention will be more clearly understood from the
30 following description of some embodiments thereof, given by way of example only with reference to the accompanying drawing which is a block diagram showing a telephone controller of the invention.

Referring to the drawing, there is illustrated a telephone controller of the invention, indicated generally by the reference numeral 1. The controller 1 comprises a control unit 2 which includes a programmable microprocessor and various other circuits which are described in detail below. The controller 1 also includes a handset interface 3 for connection to the handset of an existing cellular telephone. There is also a transceiver interface 4 for connection to a transceiver bus for a cellular telephone. Thus, the controller 1 may be easily connected or retrofitted to an existing cellular telephone. In this embodiment, the controller 1 is for control of a cellular telephone. However, it is envisaged that the handset interface 3 may be replaced by an interface for a domestic telephone, and the transceiver interface 4 may be replaced by a PSTN interface so that the controller 1 may be used for control of a domestic telephone.

The interfaces 3 and 4 are connected to each other by audio lines 5 and an audio switch 6, data lines 7 and a data switch 8, and by power lines 9 and a power switch 10. The switches 6, 8 and 10 include analogue gates. Control and data channel links 11 connect the switches 6, 8 and 10 to the control unit 2 at a microprocessor 20. The microprocessor 20 is of the Motorola 68705 type and has internal ROM and RAM, and ERAM. The microprocessor 20 is connected to a non-volatile storage ram 21, to a magnetic card reader\writer 22, and to a serial RS232C port 23. The control unit 2 also includes a realtime clock 24 and a modem data-pump 25 both of which are connected to the microprocessor 20. The modem data-pump 25 is also connected by an audio line 26 to the audio switch 6. A GPS (global positioning system) interface 27, and an RF (radio frequency) data receiver 28 are connected to the microprocessor 20.

The RF data receiver 28 operates in conjunction with the microprocessor 20 under program control for reception and output via a subscriber interface of data messages from a control station. The subscriber interface is in this
5 embodiment the magnetic card reader/writer 22 and an interface circuit (not shown) for a display incorporated in the handset. In particular, the control unit 2 may automatically establish a call connection to a central control station on receipt of such an instruction and
10 upload stored call data, or receive downloaded data and revised control programs. This considerably improves versatility.

Security of the telephone controller 1 against fraud is very important. In particular is it important that the
15 cellular telephone transceiver is not usable without the presence of the controller 1. The microprocessor 20 is programmed to store on receipt from a user via the serial port 23 or the modem 25 code data of the authorised transceiver to be used. The code data includes an
20 electronic serial number (ESN), a lock code, and a subscriber number. The microprocessor 20 is programmed to automatically read this code data from the transceiver to which it is connected immediately upon connection. It is also programmed to automatically verify the logged code
25 data and to shut down operation of the switches 6, 8 and 10 if the verification is negative. However, if verification is positive, the microprocessor 20 automatically randomly generates a new lock code and downloads it to the transceiver. The new lock code is
30 also stored permanently in the memory 21.

These security steps which are automatically made by the control unit 2 to prevent unauthorised use of the transceiver because if a user disconnects the controller

1 from the transceiver, the transceiver switches off, and on subsequent powering-up it will not function because there is a new lock code. In addition, the controller 1 will have logged the disconnection incident in the
5 memory 21 for later retrieval by the central control station.

It is envisaged that a solenoid or other mechanical locking device may be provided for in the handset cradle to prevent withdrawal of the handset except under control
10 of the controller 1. A further level of security is that the controller 1 recognises the type of transceiver to which it is attached and is programmed to function only with that type of transceiver (manufacture and model).

It will be appreciated that the above security features
15 effectively prevent by-passing of the controller 1 for unauthorised use of the telephone.

To initiate a telephone call, the subscriber inserts a magnetically coded card into the reader\writer 22 and this reads subscriber data including the amount of credit which
20 is available to that subscriber. It is envisaged that cards be issued with unique serial numbers so that once a card is used with a particular controller, it becomes tied to that controller and cannot be used with any other. This is achieved by the controller writing its own unique
25 identification number on the card the first time it is used and verifying the identification with each subsequent use. Alternatively, a family of controllers may be operable with several cards having the same serial numbers.

30 When a telephone call has been established, the control unit 2 operates in a quiescent monitoring state at which it monitors cost at all times and compares the cost with

the credit allowed. If the allowed credit is exceeded the call is terminated by control of the switches 6,8 and 10.

The credit amount for a subscriber is only one of a number of parameter values which are stored in the control unit 5 2 so that control may be effected by monitoring of these values during telephone calls. Another parameter is identification of telephone numbers which may not be called by the subscriber, for example, all long distance calls. Another parameter is that any predetermined 10 telephone number may be made free of charge. It is also possible to restrict any specific area from being called. It will thus be seen that the controller 1 allows for comprehensive control of both access and duration of calls for all available telephone numbers, the important point 15 being that the control unit 2 is programmable and the programs and data may be updated very easily by the central control station either via the serial port 23 or the modem 25. The serial port 23 and the modem 25 also allow the central control station to remotely interrogate 20 the controller 1. Upon interrogation, a decision may be automatically made to download new operating parameters.

It is envisaged that it may be desirable to have subscriber data read from the magnetic card and downloaded to the transceiver unit. This is validated as 25 an authorised user combination range by comparison with the controller serial number which would prevent telephone equipment being activated using an unauthorised card outside a designated use family group. This in effect prohibits loss of equipment usage income other than 30 revenue from calls. In these situations, the transceiver is useless if stolen. Furthermore, the controller 1 is rendered useless unless mated with the original transceiver. In the embodiment where the card contains

the Electronic Serial Number, then the controller, even when linked to its own transceiver is unusable.

- As an additional security measure, the control unit 2 is programmed to install a master control Electronic Serial
- 5 Number and a subscriber number for a short duration to make an unsolicited call to the owner as an aid to locating the device, presumed stolen. This method involves use of an onboard GPS controller to give absolute co-ordination of the present location of the telephone.
- 10 The master control Electronic Serial Number and the subscriber number would then be over-written automatically and the transceiver would be reprogrammed with the original electronic serial number and subscriber number assigned to that of the transceiver. The train of events
- 15 may be activated by the subscriber who depresses a set of keys on the handset to immediately raise a signal or he could instruct the controller to issue the signal after a period of time passes without the order being cancelled. To achieve these features, the controller is permanently
- 20 activated as it may not be switched off.

It will appreciated that for monitoring of telephone call cost, the estimation method may be used if unit data is not transmitted by the telephone authorities, or alternatively such units may be counted if available.

- 25 The GPS controller would also be useful for use with domestic telephones because it is often important to ensure that a telephone is not removed to a different PSTN interface, where cost monitoring would not take place.

In this embodiment, the microprocessor 20 is programmed to

30 store in the non-volatile storage RAM 21, the following data:

date and time of call commencement,

the number called,
the card number used to make the call, and
the number of units used on the call.

It is envisaged that incoming calls may also be logged and
5 indeed such calls may be charged on an average value
basis. Any allowed inbound call will have a payphone
detection tone injected onto the outgoing audio path to
ensure against reverse charge calls been made. The
control unit 2 is also programmed to tag on an extra three
10 digits to the end of the dialled number related to the
controller identification. This does not affect the
dialled number, but does show up in the billing
information. This, can be used to verify which telephone
made the call. Such a tag could be as an alternative to
15 the GPS position from the where call was made as well as
unique identification of the controller.

The invention is not limited to the embodiments herein
before described, but may be very varied in construction
and detail.

Claims

1. A telephone controller comprising:

- a subscriber interface;
- a bus interface for connection to a telephone, and a
- 5 bus interface for connection to a network bus;
- audio, data and power switchers connected between the bus interfaces;
- a modulation/demodulation communication circuit for communication with a central control station via the
- 10 network bus interface;
- a control unit comprising: -
 - a non-volatile memory;
 - a real time clock;
 - a control channel connected to the switches between the
 - 15 bus interfaces;
 - a processor connected to the control channel and comprising: -
 - means for storing allowed subscriber call
 - parameters;
 - 20 means for controlling subscriber call connections with reference to the allowed call parameters;
 - means for monitoring actual call parameters and for subsequently controlling the switches according to the monitored parameters values;
 - 25 means for re-setting the allowed subscriber call parameters; and
 - means for allowing interrogation of stored parameter values by the central control station, and for communication of data and programs with
 - 30 the central control station;
- a radio frequency data receiver connected to the processor; and

means in the processor for routing data received at the radio frequency data receiver to the subscriber interface and for automatically monitoring said data and initiating a communications session in response thereto.

5 2. A telephone controller as claimed in claim 1, wherein the processor of the control unit is programmable and includes non-volatile memory for storage of data and control programs, and the communication circuit has means for routing of revised control programs and data to the
10 memory.

3. A telephone controller as claimed in claims 1 or 2 wherein the control unit comprises a security means comprising: -

means for logging received code data associated
15 with an allowed network bus before connection of the bus interfaces;

means for automatically reading actual code data for a network bus to which the bus interface is connected;

means for verifying the actual code data and
20 allowing or preventing operation of the telephone depending on the verification;

means for randomly generating a lock code for a network bus on positive verification;

means for automatically downloading the lock code
25 to the network bus; and

means for permanently storing the randomly generated lock code in the control unit for future reference.

4. A telephone controller substantially as hereinbefore
30 described with referenced to and as illustrated in the accompanying drawings.

- 12 -

5. A telephone incorporating a telephone controller as claimed in any proceeding claim.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number
 GB 9220119.3

Relevant Technical fields

(i) UK CI (Edition ^K) H4K KFB, KYX

(ii) Int CI (Edition ⁵) H04M; H04Q

Search Examiner

MR M J JONES

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search

6 NOVEMBER 1992

Documents considered relevant following a search in respect of claims 1-5

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	EP A2 0287061 (FUJITSU) see abstract	---

Category	Identity of document and relevant passages	to claim(s).

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